Patent
Attorney's Docket No. 010315-089

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

UTILITY PATENT
APPLICATION TRANSMITTAL LETTER

Box PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Enclosed for filing is the utility patent application of Petter BRAGD, Shabira ABBAS and Andrea SCHMID for ABSORBENT STRUCTURE IN AN ABSORBENT ARTICLE AND A METHOD OF PRODUCING IT.

Also enclosed are:

[X] 2 sheet(s) of [X] formal [ ] informal drawing(s);

[X] a claim for foreign priority under 35 U.S.C. §§ 119 and/or 365 is [X] hereby made to 9903070-2 filed in Sweden on August 30, 1999;
[X] in the declaration;

[ ] a certified copy of the priority document;

[ ] a General Authorization for Petitions for Extensions of Time and Payment of Fees;

[ ] _____ statement(s) claiming small entity status;

[X] an Assignment document;

[ ] an Information Disclosure Statement; and

[X] Other: Preliminary Amendment.

[X] An [X] executed [ ] unexecuted declaration of the inventor(s)
[X] also is enclosed [ ] will follow.

[X] Please amend the specification by inserting before the first line the sentence --This application claims the benefit of U.S. Provisional Application No. 60/198,453, filed on April 19, 2000, the entire content of which is hereby incorporated by reference.--

[ ] A bibliographic data entry sheet is enclosed.

[X] The filing fee has been calculated as follows [X] and in accordance with the enclosed preliminary amendment:

CLAIMS					
	NO. OF CLAIMS		**EXTRA CLAIMS**	**RATE**	**FEE**
Basic Application Fee					$690.00 (101)
Total Claims	11	MINUS 20 =	0	x $18.00 (103)	
Independent Claims	2	MINUS 3 =	0	x $78.00 (102)	
If multiple dependent claims are presented, add $260.00 (104)					
Total Application Fee					
If verified Statement claiming small entity status is enclosed, subtract 50% of Total Application Fee					
Add Assignment Recording Fee if Assignment document is enclosed					
TOTAL APPLICATION FEE DUE					**690.00**

[ ] This application is being filed without a filing fee. Issuance of a Notice to File Missing Parts of Application is respectfully requested.

[X] A check in the amount of $ 690.00 is enclosed for the fee due.

[ ] Charge $ _____ to Deposit Account No. 02-4800 for the fee due.

[X] The Commissioner is hereby authorized to charge any appropriate fees under 37 C.F.R. §§ 1.16, 1.17 and 1.21 that may be required by this paper, and to credit any overpayment, to Deposit Account No. 02-4800. This paper is submitted in duplicate.

Please address all correspondence concerning the present application to:

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Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

Date: August 30, 2000

By: William C Rowland
William C. Rowland
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Patent
Attorney's Docket No. 010315-089

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Petter BRAGD et al.	)	Group Art Unit: Unassigned
	)	
Application No.: Unassigned	)	Examiner: Unassigned
	)	
Filed: August 30, 2000	)	
	)	
For: ABSORBENT STRUCTURE IN AN ABSORBENT ARTICLE AND A METHOD OF PRODUCING IT	)	
	)	

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to the examination of the above-identified patent application, please amend the application, please amend the application as follows:

IN THE CLAIMS:

Please amend claims 5, 6 and 11 as follows:

Claim 5, line 1, change "any of the preceding claims" to -- claim 1--.

Claim 6, line 1, change "any of the preceding claims" to -- claim 1--.

Claim 11, line 6, change "any of claims 1- 6" to -- claim 1--.

REMARKS

If the Examiner has any questions concerning the amendment or the above-identified

application in general, the Examiner is invited to contact the undersigned so as to expedite prosecution.

Respectfully submitted,

BURNS, DOANE, SWECKER & MATHIS, L.L.P.

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Date: August 30, 2000

Absorbent structure in an absorbent article and a method of producing it

Technical field

The present invention refers to an absorbent structure in an absorbent article such as a diaper, pant diaper, incontinence guard, sanitary napkin, wound dressing, bed protection etc. and comprising a compressed foam material which expands upon wetting. The invention further refers to a method of producing the absorbent structure and an absorbent article containing the absorbent structure according to the invention.

Background of the invention

Absorbent articles of the above mentioned kind are intended to be used for absorption of body liquids such as urine and blood. They usually comprise a liquid pervious topsheet, which during use is intended to be facing the wearer´s body, e g a nonwoven material of spunbond type, a meltblown material, a carded bonded wadding etc. They further have a liquid impervious backsheet, e g a plastic film, a plastic coated nonwoven or a hydrophobic nonwoven, and an absorbent structure arranged between the liquid pervious topsheet material and the liquid impervious backsheet. This absorbent structure may be constructed by several layers such as a liquid acquisition layer, storage layer and distribution layer.

As a liquid acquisition layer there is usually used a porous material having a high momentaneous liquid receiving capacity. Examples of such material are cellulosic fluff pulp of thermomechanic or chemothermomechanic (CTMP) type, chemically stiffened cellulosic fibers, synthetic fiber structures of different types and porous foam materials etc.

As a storage layer there is usually used cellulosic fluff pulp mixed with so called superabsorbents, i e crosslinked polymers with the ability to absorb several times their own weight (10 times or more) of body fluids. It is also possible to use an absorbent foam material as a storage layer. As a distribution layer there can be used cellulosic fluff pulp, tissue layers, foam, synthetic fibers and the like having high liquid distribution capacity. It is also possible to combine two or more of the functions acquisition, storage and distribution in one and the same layer.

It is previously known through US-A-3,512,450, EP-A-0 293 208 and EP-A-0 804 913 to use a compressed foam material of regenerated cellulose, e g viscose, as an absorbent structure in an absorbent article of the above mentioned kind, e g a sanitary napkin. The article may then be made very thin and still have a high absorption capacity. The compressed viscose foam expands quickly i the z-direction when liquid is absorbed by the material when wetted.

Object and most important features of the invention

The object of the present invention is to improve the function of an absorbent structure in the form of a compressed foam material especially with respect to liquid acquisition- and distribution capacity. This has according to the invention been achieved by the fact that the foam material comprises two integrated layers having different mean pore sizes.

There is further referred to a method of producing an absorbent structure, comprising separately forming at least two different foam materials having different pore sizes and applying the foam materials on top of each other while still not dry, after which the combined material layers are dried and compressed.

There is also referred to an absorbent article such as a diaper, a pant diaper, an incontinence guard, a sanitary napkin, a wound dressing, a bed protection etc. containing an absorbent structure according to the invention.

Further features of the invention are disclosed in the following description and of the claims.

Description of drawings

The invention will in the following be closer described with reference to an embodiment shown in the accompanying drawings.

Fig. 1 shows a schematic cross section of an absorbent structure according to the invention in compressed form containing three different integrated layers

Fig. 2 shows the absorbent structure according to Fig. 1 in expanded form.

Fig. 3 shows in a view from above an absorbent article in the form of an incontinence guard.

Fig.4 is a section according to the line IV-IV in Fig.3 on an enlarged scale.

Description of embodiments

The absorbent structure 1 according to the invention comprises at least two, in the embodiment shown in Fig. 1 and 2 three, integrated layers 2, 3 and 4. Each layer consists of a compressed foam material, which upon contact with liquid expands strongly while absorbing the liquid. The layers have different pore sizes. With pore size is meant the effective means pore size which the material has in expanded condition. The effective means pore size is determined by means of a PVD (Pore Volume Distribution)-apparatus manufactured by Textile Research Institute, Princeton, USA. The function of the PVD-apparatus is described in detail in Miller, B. and Tyomkin, L. Textile Research Journal 56 (1986) 35.

The different layers 2, 3 and 4 are preferably integrated with each other and partly penetrate into each other so that there is no clear partitioning line between the layers but a mixture of the different pore sizes. By this the liquid transport between the layers is promoted.

According to a preferred embodiment the foam material is of regenerated cellulose, such as viscose, which is a foam containing a framework of cellulose. The principle for making a porous viscose foam is known since long ago and shortly takes place in the following way. Cellulose, usually sulphite pulp, is allowed to swell in sodium hydroxide. Carbon disulphide is added at which the cellulose is successively dissolved. In order to improve the mechanical strength in the material for example cotton fibers may be added. To this cellulose solution there is added and dispersed a salt in the form of sodium sulphate. When then the solution is heated the cellulosed is regenerated (the Carbon disulphide is evaporated) and the salt (sodium sulphate) is dissolved by washing the material with water at which a porous spongelike structure is obtained. The material is dried and compressed if desired

In order to provide the desired pore size gradient different viscose solutions are used, which are applied on top of each other and then regenerated. Sodium sulphate with different particle sizes is used in the different layers, at which a different pore size of the foam is obtained. By the fact that the different layers are placed on top of each other before they are dry there is achieved an integrated structure, in which the layers partly penetrated into each other. This is verified by PVD measurements which indicate an integrated material with no gape between the different layers.

After regeneration of the cellulose and washing for removing the salt particles the material is dried and compressed to the desired density, which should be in the interval 0.1 to 2.0 g/cm^3. The material will upon liquid absorption expand quickly in volume from 2 to 20 times, preferably from 2 to 15 times its volume in compressed condition. The increase of volume at the absorption mainly occurs in the compression direction, i e in the z-direction of the material.

The material is used in such a way in an absorbent article that the layer having the largest pore size is applied on top, closest to the wearer, so that there will be a decreasing pore size in the direction away from the wearer. By this there will be a good liquid acquisition, due to the large pores in the uppermost layer, and an improved distribution in the underlying layers due to the higher capillary distribution in the layers having the smaller pores. Since liquid due to the higher capillary force of smaller pores tends to be distributed form larger to smaller pores, the distribution of liquid in the z-direction away from the uppermost layer is promoted, at the same time as rewet of liquid from the underlying layers to the upper layer is prevented

The foam may of course be of an optional polymeric material and it is possible to create different mean pore sizes of the respective foam layers by other methods than described above by means of salt crystals of different particle sizes. One such alternative way is to use different types of foaming agents when producing the different foam layers, and which provide different mean pore sizes. Another way is to influence the foaming process in such a way, e g by heating the different layers to different degrees during foaming. In this case it would be possible to use the same foaming agent in the different layers.

Superabsorbent materials may be added to the foam material in connection with the viscose production, i e before foaming. The concentration of superabsorbent preferably is in the form of a gradient, so that the layer with the largest pores contains the smallest amount of superabsorbent and the layer with the smallest pores contains the highest amount of superabsorbent. By this the largest liquid storage capacity is provided in the layer facing away from the wearer.

The superabsorbent material may also be applied on the dried foam, e g in the form of a monomer solution which is applied on the side of the which is intended to be facing away from the wearer. The monomer solution will then form a coating on one side of the foam and a part of the monomer solution will penetrate into the open pore system of the foam. The monomer solution is polymerized and is then crosslinked. With this method there is provided a gradient of the superabsorbent concentration from one side of the foam on which the monomer solution has been applied and a distance into the foam material, so far as the monomer solution has penetrated.

The monomer solution can also be in the form of a solution which when applied to the compressed foam runs into the pore system thereof and forms a coating on the pore walls.

The monomer solution may also be in the form of a foamed dispersion, which after application to one side of the compressed foam is polymerized and crosslinked. The advantage of applying the superabsorbent material in the form of a foamed dispersion is that a porous structure is formed also of the superabsorbent material, which promotes the liquid transport.

The foam material in the different layers may also be of different polymers, at which it for example would be possible to provide a hydrophilicity gradient i the z-direction by having foams of different hydrophilicity/hydrophobicity in the different layers.

In Fig. 3 and 4 there is shown an example of an absorbent article 5 in the form of an incontinence guard comprising a liquid pervious topsheet 6, a liquid impervious

backsheet 7 and an absorbent structure 1 according to the invention enclosed therebetween.

The liquid pervious topsheet 6 may comprise a nonwoven material, e g a spunbond material of synthetic filaments, a thermobonded material, e g a bonded carded fibrous material or a perforated plastic film. The liquid impervious backsheet 7 usually consists of a plastic film, a nonwoven material which has been coated with a liquid impervious material or a hydrophobic nonwoven material which resists liquid penetration.

The topsheet 6 and the backsheet 7 have a somewhat larger extension in the plane than the absorbent structure 1 and extend outside the edges thereof. The layers 6 and 7 are interconnected within their projecting portions, e g by gluing or welding with heat or ultrasonic.

Between the topsheet 6 and the absorbent structure 1 there may optionally be arranged a soft and porous liquid acquisition layer.

It is pointed out that the incontinence guard shown in the drawings and described above only is a non-limiting example of an absorbent article. Thus the shape of the article as well as its overall construction may vary. The absorbent article may also be a diaper, a pant diaper, a sanitary napkin, a bed protection or the like. It would also be possible to eliminate the separate liquid pervious topsheet 6 and have the absorbent structure 1 consisting of the foam material according to the invention be directly applied against the skin of the wearer

The absorbent structure 1 may also be combined with other absorbent layers, e g of cellulose fluff pulp, superabsorbents and the like, preferably arranged between the absorbent structure 1 and the liquid impervious backsheet 7. As mentioned above a porous and resilient liquid acquisition layer may be applied between the topsheet 6 and the absorbent structure 1.

The absorbent structure 1 according to the invention may also be arranged over only a part of the total surface of the absorbent body of the absorbent article, e g in the

intended wetting area of the article where the body liquid will be discharged and which normally is located towards the front part of the article 5. He parts of the absorbent body that are located outside the wetting area may then be of optional other absorbent material

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Claims

1. Absorbent structure in an absorbent article such as a diaper, pant diaper, incontinence guard, sanitary napkin, wound dressing, bed protection etc. and comprising a compressed foam material (1) which expands upon wetting,
characterized in
that the foam material (1) comprises at least two integrated layers (2,3,4) having different mean pore sizes.

2. Absorbent structure as claimed in claim 1,
characterized in
that the foam material (1) contains superabsorbent material.

3. Absorbent structure as claimed in claim 2,
characterized in
that the different layers (2,3,4) contain different amounts of superabsorbent materials.

4. Absorbent structure as claimed in claim 3,
characterized in
that the layer having the largest mean pore size contains the lowest amount of superabsorbent material and the layer having the smallest mean pore size contains the highest amount of superabsorbent material.

5. Absorbent structure as claimed in any of the preceding claims,
characterized in
that the foam material is regenerated cellulose, such as viscose.

6. Absorbent structure as claimed in any of the preceding claims,
characterized in
that the foam material in the different layers may be of different polymers.

7. Method of producing an absorbent structure in an absorbent article such as a diaper, pant diaper, incontinence guard, sanitary napkin, wound dressing, bed protection etc.

characterized in

separately forming at least two different foam materials having different mean pore sizes and applying the foam materials on top of each other while still not dry, after which the combined material layers are dried and compressed.

8. Method as claimed in claim 7,

characterized in

that salt crystals of different mean particle sizes are used when producing the respective foam material layers in order to provide different mean pore sizes in the respective layers.

9. Method as claimed in claim 7,

characterized in

that different types of foaming agents are used when producing the respective foam material layers in order to provide different mean pore sizes in the respective layers.

10. Method as claimed in claim 7,

characterized in

that when producing the respective foam material layers the same or different foaming agents are used and that the foaming process is effected in such a way, e g by heating the different layers to different temperatures during foaming, so that different mean pore sizes are obtained in the different layers.

11. Absorbent article such as a diaper, a pant diaper, an incontinence guard, a sanitary napkin, a wound dressing, a bed protection etc. of the kind containing a liquid permeable topsheet (5), a liquid impermeable backsheet (6) and an absorbent structure applied therebetween,

characterized in

that it contains an absorbent structure (1) as claimed in any of claims 1-6.

Abstract

Absorbent structure in an absorbent article such as a diaper, pant diaper, incontinence guard, sanitary napkin, wound dressing, bed protection etc. and comprising a compressed foam material (1) which expands upon wetting, at which the foam material (1) comprises at least two integrated layers (2,3,4) having different mean pore sizes. (Publication figure 1)

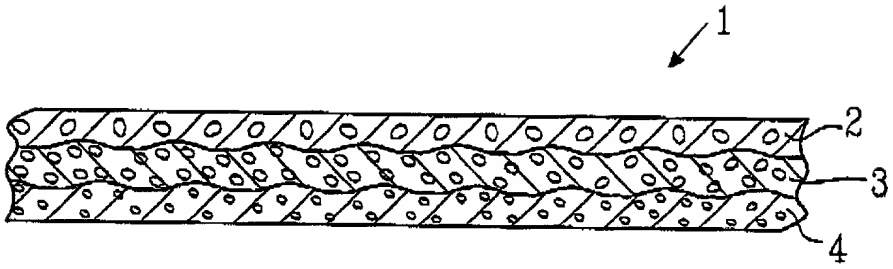

FIG.1

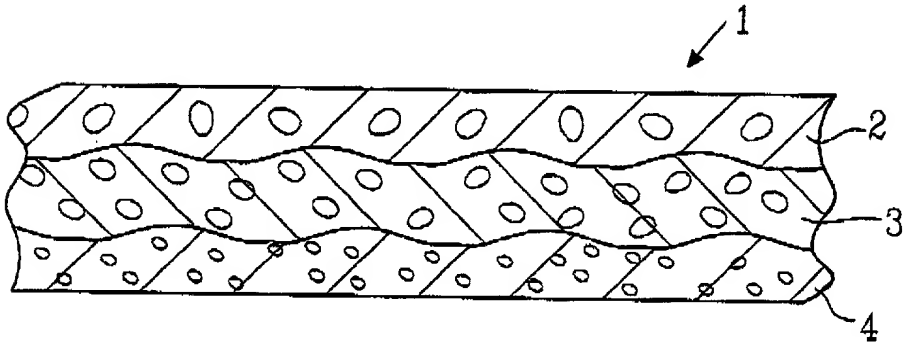

FIG.2

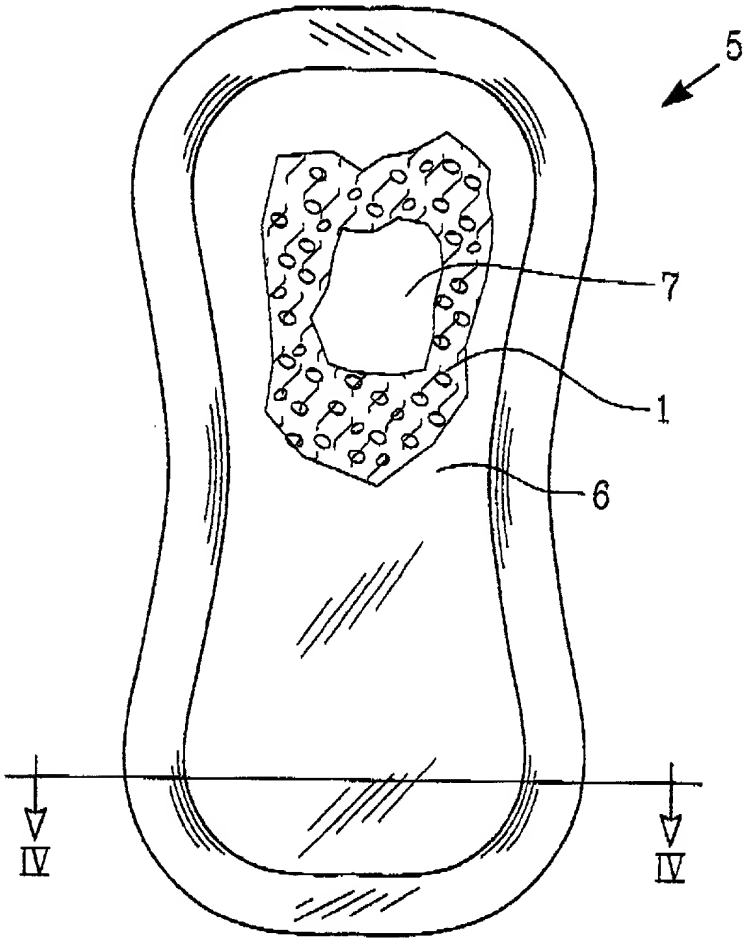

FIG.3

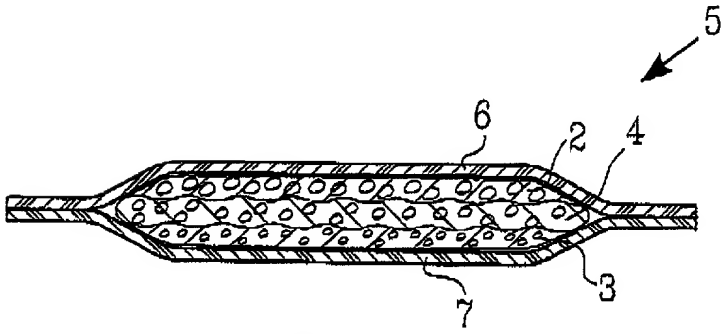

FIG.4

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **Absorbent structure in an absorbent article and a method of producing it.**

the specification of which
[ ] is attached hereto.
[ ] was filed on _____ as United States Application Number or PCT International Application Number_____ and was amended on _____ (if applicable). ___

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, § 119 (a)-(d) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate, or any PCT international application having a filing date before that of the application on which priority is claimed:

Prior foreign application(s)			
Country	Application Number	Date of Filing (day/month/year)	Priority Claimed
Sweden	**9903070-2**	**30.08.1999**	YES [X] NO [ ]
			YES [ ] NO [ ]

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below:
Application Number: 60/198,453 Filing Date: April 19, 2000
Application Number: Filing Date:

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT international application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

U.S. Parent Application Serial Number: Parent Filing Date: Parent Patent No:

U.S. Parent Application Serial Number: Parent Filing Date: Parent Patent No:

PCT Parent Number: Parent Filing Date:

POWER OF ATTORNEY: I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's signature: Petter Bragd Date: August 22, 2000

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Inventor's signature: Shabira Abbas Date: August 22, 2000

Residence: **Kåserigatan 2** Citizenship: **Swedish**

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Investor`s signature: Andrea Schmid Date: August 22, 2000

Residence: **Sjökullevägen 13** Citizenship: **Swedish**

Post Office address: **435 42 MÖLNLYCKE, Sweden**

Full name of fourth joint inventor (given, name, family name):

Investor`s signature: Date:

Residence: Citizenship:

Post Office adress:

☐ Additional inventors are being named on separately numbered sheets attached hereto.